to the pinned magnetic field is so selected that the magnetic field from the sense current is in the same direction as that of the direction of the bias magnetic field from the antiferromagnetic field to be applied to the ferromagnetic layer B (or that is, in the same direction as the magnetization direction of the ferromagnetic layer B). The reason is because, when the magnetic thickness of the ferromagnetic layer A is larger than that of the ferromagnetic layer B, a stray magnetic field that corresponds to the magnetic thickness difference between the ferromagnetic field and the ferromagnetic field is applied to the free layer, like in conventional spin valve films having a single-layered pinned magnetic layer, and, as a result, the perpendicular magnetization configuration of the free layer and the pinned magnetic layer is disturbed by that stray magnetic field. This causes the problem of asymmetry of the reproduction waves, thereby bringing about reproduction output reduction. The stray magnetic field could be canceled by applying a sense current in such a manner that the magnetic field by the sense current could be in the same direction as the direction of the magnetic coupling bias magnetic field, as in Fig. 26 which shows the magnetization and the stray magnetic field in spin valve films.

It is desirable that a simple metal of Cu, Au or Ag or an alloy consisting essentially of those metals is used for the nonmagnetic spacer layer. Basically, the thickness of the

nonmagnetic spacer layer may well be in a range between 1 and 10 nanometers or so, capable of ensuring the necessary resistance change rate. Especially in the spin valve films of the invention, it is desirable that the thickness of the nonmagnetic spacer layer falls between 1.5 nanometers and 2.5 nanometers, as being able to control the interlayer-coupling magnetic field that may be generated between the pinned magnetic layer and the free magnetic layer, to the level of at most 15 Oe, and as being able to produce a high resistance change rate.

For the free layer, employable is any of Co, a Co alloy such as CoFe, CoNi, CoFeNi or the like, or a laminate film of those metals and alloys. For example, employable is a laminate film composed of an NiFe alloy layer and a thin Co layer, in which the thin Co layer is to be adjacent to the nonmagnetic interlayer. It is desirable that the thickness of the free layer falls between 1 and 10 nanometers.

Table 12 shows a varying thickness of the free layer versus the resistance change rate $\Delta R/R$, in which the thickness of the pinned magnetic layer is fixed to be 2.5 nanometers. As in Table 12, it is understood that, in the invention, the thickness of the free layer is more preferably from 2 to 5 nanometers, as giving high resistance change rates.

Table 12

Thickness of Free Layer (nm)	Thickness of Ferromagnetic Layer A = Ferromagnetic Layer B (nm)	Resistance Change Rate ΔR/R* (%) (single-layered free layer of CoFe)	Resistance Change Rate ΔR/R** (%) (laminated free layer with 1 nm Co adjacent to interlayer)
1	2.5	6.2	5.7
2	2.5	7.5	7.0
3	2.5	7.9	7.2
4	2.5	7.8	7.2
5	2.5	7.5	7.1
6	2.5	6.9	6.4
7	2.5	6.6	6.0

The ferromagnetic layers A and B have the same thickness and are both of CoFe.

Table 13 shows a varying thickness of the ferromagnetic layer A of the pinned magnetic layer versus the resistance change rate ΔR/R, in which the thickness of the free layer is fixed to be 4 nanometers. As in Table 13, it is desirable that the thickness, t(F), of the free layer of from 2 to 5 nanometer Thick and the thickness, t(P) of the ferromagnetic layer A satisfy the following condition:

$$-0.33 \leq \{t(F) - t(P)\}/t(F) \leq 0.67,$$

for producing a high resistance change rate.